

Work Order ID 67454

Monday, March 21, 2011 2:05:36 PM



Page 1

Item ID: D412-664-203TRN

Accept



Setup Start



Revision ID:

Stop



Item Name: Crosstube Turning Detail

Start Date: 3/21/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 3/25/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals:

Process Plan:

Date: 11-03-21

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run Start



Stop

Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

Draw Nbr

Revision Nbr

D412-664-243

Rev E

100

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs DT8534 on both ends as per Folio FA166
2-Turn first side as per Folio FA166
3- File transition lines smooth.

aml 11/03/23

1

110

0.00



QC1- Inspect dimensions to dimension sheet

QC

Memo

0.00

Quality Control

aml 11/03/23

1

120

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA166
2- File transition lines smooth.
3- Remove sand and plugs
4-Scribe part # and batch # using vibrating stilus

aml 11/03/25

1

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D012-664-203 TRW PAR #: _____ Fault Category: 10 tubes NCR: Yes No DQA: [Signature] Date: 11/03/25
 Resolution: accepted Disposition: use as is QA: N/C Closed: [Signature] Date: 11/04/18

NCR: 67454		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
11.03.25	100	- OD UNDER TOLERANCE IN SOME LOCATIONS - LENGTH IS 124.280 R.C. process.	<u>[Signature]</u> 11.03.25 <u>DS1042</u>	Acceptable. MARG MARGIN OF SAFETY STILL POSITIVE. TRIM CUFFS IF REQ'D AFTER BENDING	<u>[Signature]</u> 11/03/25	<u>[Signature]</u> 11.3.25	<u>[Signature]</u> 11.03.25 <u>DS1042</u>	<u>[Signature]</u> 11/03/25
		<u>[Signature]</u>	<u>[Signature]</u> <u>DS1042</u>	Reel tag tube for banding will work in fo.			<u>[Signature]</u> <u>DS1042</u>	<u>[Signature]</u> 11/03/25

NOTE: Date & initial all entries

Work Order ID 67454

Monday, March 21, 2011 2:05:36 PM



Page 2

Item ID: D412-664-203TRN

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Item Name: Crosstube Turning Detail

Start Date: 3/21/2011 Start Qty: 1.00



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Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

130

QC1- Inspect dimensions to dimension sheet

0.00



QC

Memo

0.00

ant 11/03/25

1 6

Quality Control

140

QC8- Inspect parts - second check

0.00



QC

Memo

0.00

R 11.3.25

1 0

Quality Control

150

Crosstubes Chemical Conversion

0.00



HandFXtube

Memo

0.00

DP 11-3-25

Hand Finishing Crosstubes

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 67454

Monday, March 21, 2011 2:05:36 PM



Page 3

Item ID: D412-664-203TRN

Accept



Setup Start



Revision ID:

Stop



Item Name: Crosstube Turning Detail

Start Date: 3/21/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 3/25/2011 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

160

QC3- Inspect Part Finish

0.00



QC

Memo

0.00

Quality Control

1 0 881/03/25

170

Packaging

0.00



Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack
Location: 46

DP

①

180

QC21- Final Inspection - Work Order Release

0.00



QC

Memo

0.00

Quality Control

WFB 11/4/18

MRF
11-04-29

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

Monday, March 21, 2011 2:05:42 PM

Page 1

Work Order ID: 67454



Parent Item: D412-664-203TRN



Parent Item Name: Crosstube Turning Detail


Start Date: 3/21/2011

Required Date: 3/25/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A 08-03-06 new issue DD verified by:eec
IPP Rev B 08.04.02 Removed polish EC verified by: DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6009-129 		Manufactured	No			120	Each	6.0000	1	1			

Crosstube Material

Location

Loc Qty

Loc Code

LG

6

38342

2

53594

4

7134691 X1

mrk 11/03/23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD	Work Order: 67434
Description: Crosstube Assembly (412 High Aft)	Part Number: D412-664-243
Inspection Dwg: D412-664-243 Rev: E	Page 1 of 1

FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.684	+0.005/-0.000	2.688	—		Micr CAL-04	
	2.748	+0.005/-0.000	2.753	—		"	
	2.884	+0.005/-0.000	2.881		—	"	
	3.019	+0.005/-0.000	3.013		—	Micr CAL-05	
	3.163	+0.005/-0.000	3.168	✓	—	"	
	3.308	+0.005/-0.000	3.313	—		"	
	3.429	+0.005/-0.000	3.423	—		"	
	2.990	+0.005/-0.000	2.995	—		Micr CAL-04	
	2.618	+0.005/-0.000	2.622	—		"	
	0.200	+/-0.010	0.205	—		Vern ML-7	
	R0.063	+/-0.010	R.063	—		Rad-gage	
	R0.500	+/-0.010	R.500	—		"	
	4.971	+/-0.030	4.900	—		Vern ML-7	
SIDE B	2.684	+0.005/-0.000	2.689	—		Micr CAL-04	
	2.748	+0.005/-0.000	2.753	—		"	
	2.884	+0.005/-0.000	2.884	—		"	
	3.019	+0.005/-0.000	3.013		—	Micr CAL-05	
	3.163	+0.005/-0.000	3.167	—		"	
	3.308	+0.005/-0.000	3.313	—		"	
	3.429	+0.005/-0.000	3.433	—		"	
	2.990	+0.005/-0.000	2.994	—		Micr CAL-04	
	2.618	+0.005/-0.000	2.622	—		"	
	0.200	+/-0.010	0.208	—		Vern ML-7	
	R0.063	+/-0.010	R.063	—		Rad-gage	
	R0.500	+/-0.010	R.500	—		"	
	4.971	+/-0.030	5.000	—		Vern ML-7	
	124.100	+/-0.020	124.280	—	—	M-type ML-2	

Measured by: <i>aml</i>	Audited by: <i>ml</i>	Prototype Approval:	N/A
Date: 11/03/23	Date: 11.3.25	Date:	N/A

Rev	Date	Change	Revised by	Approved
A	04.06.16	New Issue (P/O D412-664-203)	KJ/JLM	
B	06.03.09	Dwg Rev updated	KJ/JLM	
C	07.05.08	Tolerance updated for dimension 4.971	KJ/JLM	
D	10.02.02	Dimension 124.100 was 124.09	KJ	<i>[Signature]</i>

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Item	Qty -243	Part Number	Description
1	X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
2	1	D6009-129	CROSSTUBE
3	2	D3595-063-570	RUBBER CUSHION
4	1	D2896-1	SUPPORT
5	2	D3189-1	CHAFING SHIELD
6	2	D2856-600-1009	ABRASION STRIP
7	4	MS21920-28	CLAMP
8	2	MS21920-30	CLAMP (OR MS21920-32)
9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6009-129
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING/TRIMMING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: SCRIBE DART PART NUMBER "D412-664-243" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- 7) WEIGHT: 47.0 lbs (PER IIN-D212-664)
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
- 14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 15) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 16) TORQUE CLAMPS 80 TO 100 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER

NO. 67459

PL 11-03-21

RELEASED
2009-10-29

E	REFORMAT/REVISE GENERAL NOTES; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.	RF	09.09.30
D	REMOVE D2732-058, CHANGE TO D3595-063-570	PH	07.03.09
C	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398, MS21920-32 WAS MS21920-30	MB	06.10.27
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	01.10.17
REV.	DESCRIPTION	BY	DATE
DESIGN	PH	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	RF		
CHECKED	97	DRAWING NO.	REV. E
MFG. APPR.	DS	D412-664-243	SHEET 1 OF 4
APPROVED	AD	TITLE	SCALE
DE APPR.	TH	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30	COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE LOANED FOR ANY PURPOSE OR COPIED OR REPRODUCED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

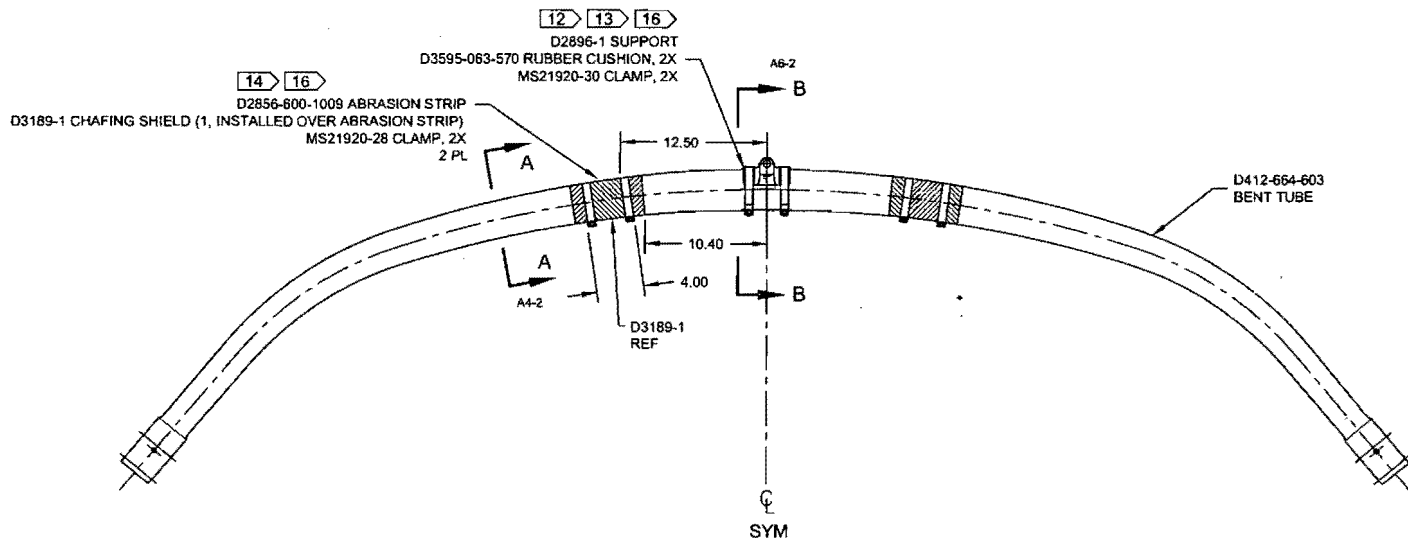
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

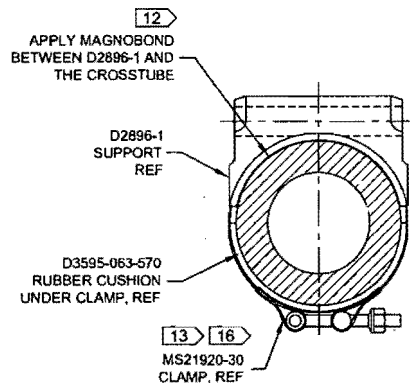
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

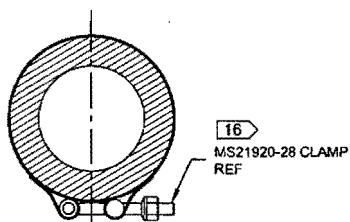
NOTE: Date & initial all entries



D212-664-243
ASSEMBLY DETAIL E



SECTION B-B D4-2
SCALE 4X



SECTION A-A C6-2
SCALE 4X

4067454

RELEASED
2009-10-28
MP

DESIGN	<i>PH</i>	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>PS</i>	DRAWING NO.	REV. E
MFG. APPR.	<i>PS</i>	D412-664-243	SHEET 2 OF 4
APPROVED	<i>MP</i>	TITLE	SCALE
DE APPR.	<i>MP</i>	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
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W/O:		WORK ORDER CHANGES					
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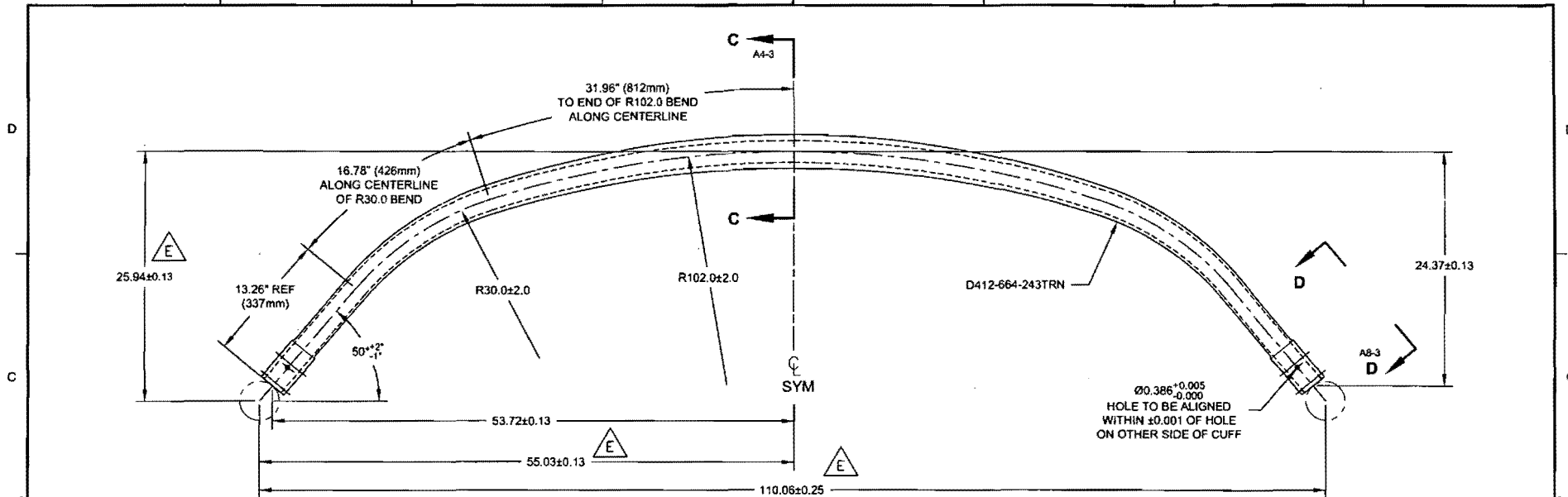
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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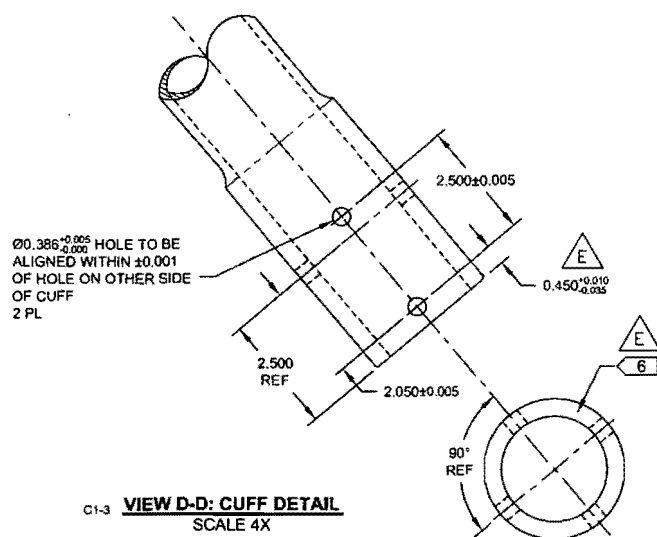
8 7 6 5 4 3 2 1



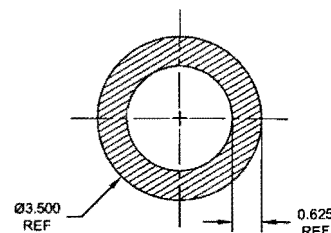
D412-664-603 10 E
BENDING AND DRILLING DETAIL

u/067454

RELEASED
 2009-10-29
MP



C1-3 **VIEW D-D: CUFF DETAIL**
 SCALE 4X



SECTION C-C D5-3
 SCALE 4X

DESIGN	<i>PH</i>	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>PS</i>	DRAWING NO.	REV. E
MFG. APPR.	<i>PS</i>	D412-664-243	SHEET 3 OF 4
APPROVED	<i>MP</i>	TITLE	SCALE
DE APPR.	<i>MP</i>	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
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8 7 6 5 4 3 2 1

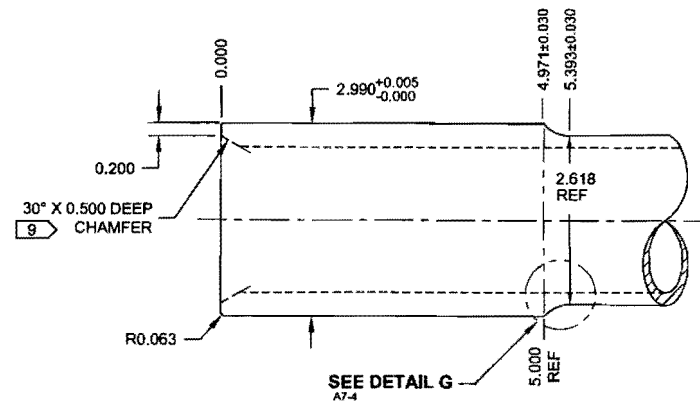
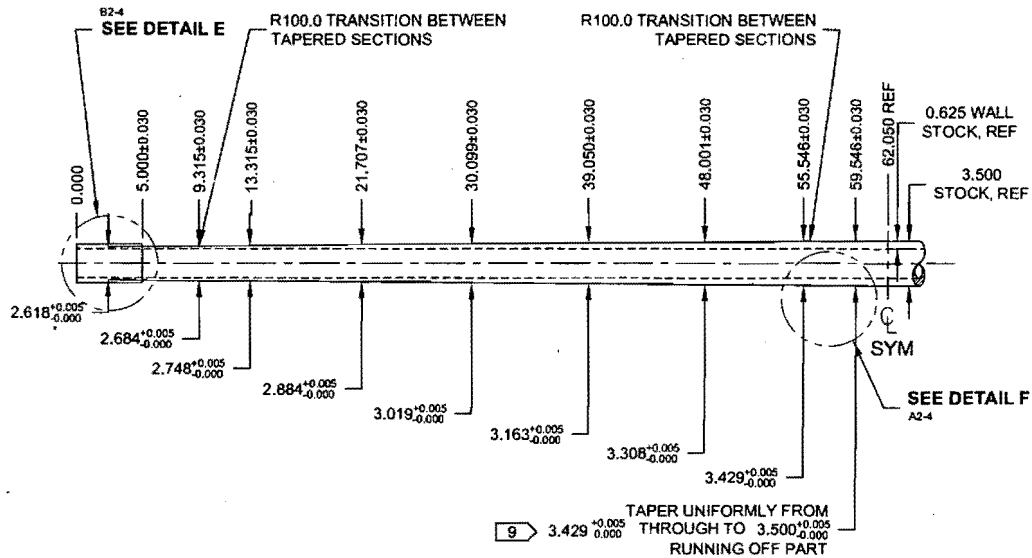
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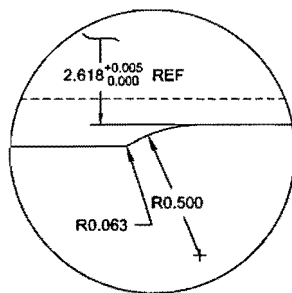
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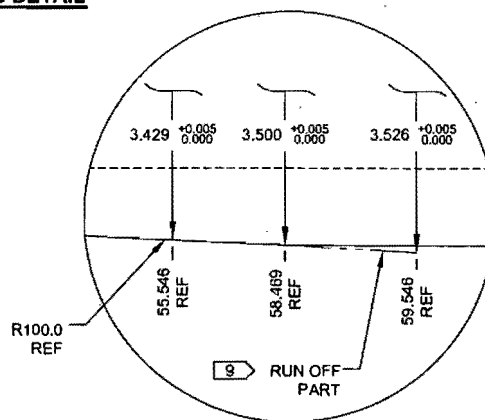


DETAIL E:
CROSSTUBE CUFF D8-4
SCALE 5X

D412-664-243TRN
TURNING DETAIL



DETAIL G:
CUFF TRANSITION C2-4
SCALE 10X



DETAIL F:
TAPER RUN-OFF C4-4
NOT TO SCALE

RELEASED
2009-10-29

DESIGN	PH	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	9	DRAWING NO.	REV. E
MFG. APPR.	11	D412-664-243	SHEET 4 OF 4
APPROVED	12	TITLE	SCALE
DE APPR.	14	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

SR-D412-664-1

Rev B

3.2 Crosstube Comparison

The Dart aft crosstube is defined by drawing D412-664-243. The Bell/AA aft crosstube dimensions are based on measurements taken from Aeronautical Accessories crosstube 412-321-304. The relative locations of the sections used in this comparison are shown in Figure 3 (on page 7). Table 1 gives the cross-sectional properties of the Bell/AA and Dart crosstubes at locations that correspond to changes in taper of the Dart crosstubes.

Table 1: Aft High-Gear Crosstube Cross-sections

SECTION	Cross tube	Damage Tolerance	O.D. (in)	I.D. (in)	Area (in ²)	Inertia (in ⁴)
A-A	Bell/AA Aft	0.000	3.500	2.250	5.645	6.108
	Bell/AA Aft w/ dam. tol.	0.000			5.645	6.077
	Dart Aft	0.000	3.500	2.250	5.645	6.108
	Dart Aft w/ dam. tol.	0.015			5.501	5.845
B-B	Bell/AA Aft	0.000	3.314	2.250	4.650	4.663
	Bell/AA Aft w/ dam. tol.	0.000			4.650	4.663
	Dart Aft	0.000	3.308	2.250	4.618	4.620
	Dart Aft w/ dam. tol.	0.015			4.417	4.410
C-C	Bell/AA Aft	0.000	3.169	2.250	3.911	3.693
	Bell/AA Aft w/ dam. tol.	0.015			3.881	3.617
	Dart Aft	0.000	3.163	2.250	3.881	3.655
	Dart Aft w/ dam. tol.	0.015			3.680	3.452
D-D	Bell/AA Aft	0.000	3.025	2.250	3.211	2.852
	Bell/AA Aft w/ dam. tol.	0.015			3.181	2.784
	Dart Aft	0.000	3.019	2.250	3.182	2.820
	Dart Aft w/ dam. tol.	0.015	3.013		2.981	2.657
E-E	Bell/AA Aft	0.000	2.890	2.250	2.584	2.166
	Bell/AA Aft w/ dam. tol.	0.012			2.560	2.116
	Dart Aft	0.000	2.884	2.250	2.556	2.138
	Dart Aft w/ dam. tol.	0.012	2.881		2.361	1.960
F-F	Bell/AA Aft	0.000	2.754	2.250	1.981	1.566
	Bell/AA Aft w/ dam. tol.	0.012			1.957	1.520
	Dart Aft	0.000	2.748	2.250	1.955	1.541
	Dart Aft w/ dam. tol.	0.012			1.759	1.368
G-G	Bell/AA Aft	0.000	2.690	2.250	1.707	1.312
	Bell/AA Aft w/ dam. tol.	0.012			1.683	1.269
	Dart Aft	0.000	2.684	2.250	1.682	1.289
	Dart Aft w/ dam. tol.	0.012			1.486	1.118
H-H	Bell/AA Aft	0.000	2.620	2.250	1.415	1.055
	Bell/AA Aft w/ dam. tol.	0.012			1.391	1.014
	Dart Aft	0.000	2.618	2.250	1.407	1.048
	Dart Aft w/ dam. tol.	0.012			1.212	0.879
J-J	Bell/AA Aft	0.000	3.000	2.250	3.093	2.718
	Bell/AA Aft w/ dam. tol.	0.038			3.017	2.547
	Dart Aft	0.000	2.990	2.250	3.045	2.665
	Dart Aft w/ dam. tol.	0.038			2.798	2.367

2.650
2.6241.956
1.945

SP-D412-664-1.

Rev. B

4.2 Crosstube Strength Comparison (refer to Table 1 on page 9)

Table 4: Aft High-Gear Crosstube Strength Comparison

SECTION **	Cross tube	Bending Ultimate (lb*in)	Bending Yield (lb*in)	Tension Ultimate (lb)	Tension Yield (lb)	Shear Ultimate (lb)
A-A	Bell/AA aft w/ DT	229208	194480	372573	316123	237092
	Dart aft w/ DT	257186	220445	423592	363079	225549
	Margin of Safety	0.12	0.13	0.14	0.15	-0.05
B-B	Bell/AA aft w/ DT	185722	157582	306876	260379	195285
	Dart aft w/ DT	205296	175968	340111	291523	181098
	Margin of Safety	0.11	0.12	0.11	0.12	-0.07
C-C	Bell/AA aft w/ DT	150671	127842	256168	217355	163016
	Dart aft w/ DT	168076	144065	283367	242886	150884
	Margin of Safety	0.12	0.13	0.11	0.12	-0.07
D-D	Bell/AA aft w/ DT	121466	103062	209933	178125	133594
	Dart aft w/ DT	135559	116194	229531	196741	122218
	Margin of Safety	0.12 0.10	0.13	0.09	0.10	-0.09
E-E	Bell/AA aft w/ DT	96650	82006	168937	143340	107505
	Dart aft w/ DT	104653	89703	181799	155828	96802
	Margin of Safety	0.08 0.07	0.09	0.08	0.09	-0.10
F-F	Bell/AA aft w/ DT	72863	61823	129148	109580	82185
	Dart aft w/ DT	76653	65703	135478	116124	72138
	Margin of Safety	0.05	0.06	0.05	0.06	-0.12
G-G	Bell/AA aft w/ DT	62261	52827	111087	94256	70692
	Dart aft w/ DT	64153	54988	114454	98103	60943
	Margin of Safety	0.03	0.04	0.03	0.04	-0.14
H-H	Bell/AA fwd w/ DT	51075	43336	91820	77908	58431
	Dart fwd w/ DT	51690	44305	93291	79964	49675
	Margin of Safety	0.01	0.02	0.02	0.03	-0.15
J-J	Bell/AA fwd w/ DT	112069	95088	199089	168924	126693
	Dart fwd w/ DT	121931	104512	215450	184672	114720
	Margin of Safety	0.09	0.10	0.08	0.09	-0.09

*The negative shear margins are addressed in Section 4.4

**for Section A-A, the worst case corresponds to min stock OD instead of max stock OD, so the calculation is slightly different then the sample calculation presented in section 4.1

MARGINS STILL POSITIVE & ACCEPTABLE

CP 11.03.25

